Section 4 - Environmental Inventory

A. Topography, Geology, and Soils

1. Topography

Hanover is part of the coastal lowland section of the New England physiographic province and has gently rolling to flat topography characteristic of this region.[1] Hanover is shown on four USGS Topographic Maps: Whitman, Weymouth, Cohasset and Hanover. The elevation throughout the town ranges from 10± feet above sea level at the headwaters of the North River to 177± feet at the top of Walnut hill in the Northeast corner of Hanover. Other significant topographical features include several low hills found in the northeast and northwest sections of town, and low areas containing swamps, three of which are named (see table). Several cranberry bogs in the southeast and southwest sections of Hanover also present, as well as a sand pit in the south and a gravel pit by the Silver Brook.[2]

Table 4-1
Major Hills in Hanover

Hills	**Elevation**
Walnut Hill	177± feet
Tumbledown Hill	140± feet
King Hill	140± feet
(Water tower hill)	155± feet

Source: USGS Topographic Maps; Whitman, Hanover, Weymouth, Cohasset Quadrangles

Drainage patterns throughout Hanover are determined by an extensive swamps and brook system which feed three major waterways: the Drinkwater River, the Indian Head River, and the Third Herring Brook. Most of the drainage from the western side of town flows into the Drinkwater river, eventually reaching the Indian Head River. Other brooks flow directly into the Indian Head River and The Third Herring Brook, both of which define over half of the town's boundaries. These two waterways come together to form the North River at Hanover's borders with Pembroke and Norwell, and are a significant area resource.[3]

[1] Town of Hanover. 1979. Hanover Open Space Plan, page 26.
[2] United States Geological Survey. Quadrangle maps for Weymouth (1971); Whitman (1962); Cohasset (1961); and Hanover (1978).
[3] Ibid. (same Quads)

Table 4-2 Drainage Area Tributaries		
Drinkwater River Drainage area	**Indian Head River Drainage area**	**Third Herring Brook Drainage area**
French Stream	Iron Mine Brook	Silver Brook
Ben Mann Brook		Molley Brook
Cushing Brook		
Longwater Brook		
Torrey Brook		

Source: USGS Topographic Maps; Whitman, Hanover, Weymouth, Cohasset Quadrangles

2. Geology

Bedrock Geology: The bedrock geology includes rocks of both igneous and sedimentary origin which have undergone low-grade metamorphic episodes. The two major rock types include a light grayish-pink to greenish-gray granite which was intruded into the existing bedrock and a sedimentary rock comprised of shale, sandstone, conglomerate and greywacke with minor beds of fossil plants. The sediments making up the second rock type were deposited after the intrusion of the granite, when the area formed part of the Narragansett Basin.

The two major rock types in Hanover have each undergone low grade metamorphism. The zone associated with the granite, found in the eastern side of the town, exhibits mineral assemblages associated with a low grade metamorphic zone, formed during the Proterozoic Z metamorphism. These rocks often show greenschist, greenstone, felsite and quartzite assemblages enveloped in granite. While the rocks found mostly on the western side of town, part of the metamorphic zone associated with the sedimentary rocks, exhibit mineral assemblages typical of the Chlorite Zone. The typical chlorite-muscovite assemblages visible within these rocks were formed during a Pennsylvanian-Permian metamorphic episode 270 million years ago.

Hanover is also located on the edge of the Narragansett Basin between two tectonic provinces, with several minor faults trending in a general north-south direction. The Milford-Dedham Zone, which includes the town of Hanover, has had a complex tectonic history involving granite intruded into older volcanic and plutonic rocks millions of years ago, followed by a period of erosion, and the deposition of continental sediments on top of the older granite.[4]

Surficial Geology: The surficial deposits in Hanover which make up most of the soils and all of the deposits above the bedrock include predominantly glacial sediments. As the glaciers retreated northward at the end of the Wisconsin Ice Age, they left thick stratified drift deposits made up of well sorted sands and gravels and unstratified deposits made up of poorly sorted tills.

[4] Massachusetts Bedrock Geology Map

Even more recently organic matter has accumulated in the form of swamp deposits and alluvium has been deposited by present day streams.[5]

3. Soils

The general soil types which can be found in Hanover include three different associations. A small area of Tidal Marsh-Dune land-Coastal beach association is located in the southeast corner of town and is part of the influence of the North River. A large finger of Hinckley-Merrimack-Muck association covers the central portion of Hanover. The third general soil type can be found in both the northwestern and eastern areas of town and is known as the Scituate-Essex-Merrimac association.

The geographic location of soil types within Town as mapped by the Soil Conservation Service are illustrated in Figure 4-1.

Table 4-3
General Soil Associations and Distribution

General Soil Associations	Approximate Acreage	Percent
Scituate-Essex-Merrimac	5,370	53
Hinckley-Merrimac-Muck	4,500	45
Tidal marsh-Dune Land-Coastal Beach	190	2
TOTAL:	10,060	100

Source: Acreage derived from General Soil Map of Plymouth County (1968).

The most predominant soil association in Hanover is the Scituate-Essex-Merrimac Association, occupying approximately 53% of the town's land area. Hills and ridges are interspersed among broad, low-lying plains and terraces. The slopes for the most part are gentle to moderately steep. The maximum elevation is less than 200 feet. Essex and Scituate soils occupy the uplands. They are deep, gently sloping to moderately steep coarse sanding loams underlain at a depth of 18 to 30 inches by firm but coarse glacial till. The Merrimac soils occupy the nearly level plains and terraces.[6]

The Hinckley-Merrimac-Muck Association, occupying approximately 45% of the town's area, consists of broad, low ridges, nearly level plains and terraces, and knobby, irregular ridges. Intermingled with these are low, flat wet areas. The elevation of this association is generally between 50 and 150 feet. Hinckley soils are deep, excessively drained gravelly loamy sands on gentle to steep slopes. Merrimac soils are well-drained and somewhat excessively drained sandy loams underlain by sand and gravel. Muck is an organic soil that occurs in low-lying areas. [7]

[5] United States Geological Survey. Hanover & Whitman Quads (Weymouth & Cohasset unpublished)

[6] Soil Survey Plymouth County Massachusetts. 1969. General Soils Map and description.

[7] Ibid.

Figure 4-1: Soils

In Hanover the Tidal marsh-Dune land-Coastal beach Association, which occupies approximately 2% of the town's land area, consists of tidal marshes along the North River. Tidal marshes vary greatly in composition. Some areas consist mainly of organic material and others of mineral material, chiefly silt and clay. Tidal marsh is valuable as habitat for various kinds of waterfowl, for some mammals, and for many marine organisms. [8]

4. Vegetation

The value of vegetation as a natural resource is unfortunately often overlooked or taken for granted in many communities. The usefulness of vegetation extends beyond its traditional role of providing aesthetically pleasing views and variety in the landscape. Woodlands, wetlands, abandoned fields and orchards are all forms of vegetation. In addition to creating and landscape, vegetation plays a variety of roles:

- *protects surface and groundwater bodies by stabilizing soils and preventing erosion*
- *acts as a visual and sound buffer between incompatible uses*
- *provides wildlife habitat*
- *provides recreational opportunities*
- *improves air quality*[9]

Hanover is vegetated with a variety of plant species commonly found on well drained upland soils throughout southeastern Massachusetts. Pine and oak forests dominate the upland forests. Other species include hemlock, swamp maple, hickory, cedar, wild cherry, and birch.

Of particular concern is protecting and preserving vegetation that comprises the unique natural communities found within the Town of Hanover. Massachusetts Natural Heritage & Endangered Species Program, Division of Fisheries & Wildlife, has listed one such area located within Hanover as an "Exemplary Natural Community". This area is located within the southeastern corner of town, adjacent to the Indian Head River (See Figure 4-2). Specifically, the community located along the river is classified as a Gulf of Maine Freshwater Tidal Marsh, which are uncommon natural communities in Massachusetts because they are limited by geology and geography to short stretches of tidal rivers in coastal areas. Freshwater tidal marshes are often close to developed areas and have been partially filled or destroyed by channelization of the river, and have been impacted by oil, pesticides, and heavy metal effluent, and excess nutrients from septic and sewage systems. Development within this area of Hanover should undergo additional regulation and residential septic systems should consider additional innovative designs discussed elsewhere.

Vegetation within this community is diverse, with herbaceous plants, grasses, and rushes all growing mixed together. Vegetation zones are present, although seldom distinct. The lowest areas have aquatic floating and emergent plants, and the higher areas support a taller mix of plants, often dominated by cattails or sweet flag, or wild rice in late summer. There is a pronounced seasonal sequence of plant dominance, with the lower areas going from bare mud to broad-leaved plants (such as arrow-arum), then to dominance by grasses and herbaceous plants.

[8] Soil Survey Plymouth County Massachusetts. 1969. General Soils Map and description.

[9] Town of Hanover. 1979. Hanover Open Space Plan

Variation in diversity of species composition and growth form are typical of freshwater tidal marsh communities.

Aquatic vegetation expected to be present includes arrow-arum (Peltandra virgincia), Pickerel wee (Pontedaria cordata), Arrowheads (Sagittaria latifolia and S. rigida), and yellow water lily (Nuphar luteum). Herbaceous annuals such as jewelweed (Impatiens spp.), smartweeds and tearthumbs (Polygonum spp.), and bur-marigolds (Bidens spp) are among the plants encountered in areas scoured by strong fall and winter tidal currents. Sweetflag (Acorus calamus), tall reed grass (Phragmites communis), in non aggressive populations, both cattails (Typha angustifolia and T. latifolia), spike-sedges (Eleocharis spp.), bulrushes (Scirpus spp.), and bur-reeds (Sparganium spp.) are common perennials of the freshwater tidal marsh. Cordgrasses and saltmeadow hay (Spartina spp) that dominate salt marshes do not dominate in the freshwater tidal marshes, although other grasses such as will rice (Zizania aquatic) and sedges may be important components of the freshwater tidal marsh community. The freshwater tidal marsh community includes many state listed rare species, including Parker's Pipewort (Eriocaulon parkeri), Long's Bitter-Cress (Cardamine longii), River Arrowhead (Sagittaria subulata), Estuary Beggar-ticks (Bidens hyperborea), and Pygmyweed (Crassula aquatica). The structural diversity of the vegetation (broad leaved plants, grasses, and shrubs interspersed with open water) supports a high diversity of bird life. Ducks and geese, freshwater snakes and turtles, and insects are more diverse in freshwater tidal marshes than in saltwater tidal marshes, although the fish, molluscs, and zooplankton fauna is much less diverse.

According to Massachusetts Natural Heritage & Endangered Species Program, Division of Fisheries & Wildlife, several of Hanover's wetland areas contain three rare species of vascular plants (See Figure 4-2). All three have the state status "Endangered".

Estuary Beggar-Ticks was first observed in 1928 and last reported observed in 1987. This plant is an annual that reaches the height of a half of a meter, and has a yellow flower that appears from August through September. Its habitat is generally in tidally influenced estuaries, but occur well upstream where salinity is low, as is the case in Hanover. Estuary beggar-ticks is considered an "Endangered" species in Massachusetts. Only three occurrences have been reported. This species is rare in the state because it is near the southern limit of its range and because fewer than five exemplary occurrences of the community type it inhabits are found in Massachusetts. Since one of these exemplary occurrences of the community type is located within the Hanover Indian Head River freshwater tidal marsh described above, it is important that planning decisions protect and preserve this community type.

The second endangered species of vegetation also found within the Indian Head River freshwater tidal marsh is the Estuary Pipewort, which is a small, delicate, erect perennial in the Pipewort family. It is grass like in appearance and grow 2-6 cm in length, and has small whitish to yellowish flowers that appear from late July to late September. The Hanover location is one of four current stations and three historical stations in which Estuary Pipewort has been identified. The last year that it was reported observed in Hanover is 1993.

River Arrowhead is the third endangered species found within the Indian Head River freshwater tidal marsh.

Figure 4-2: Scenic Resources and Unique Environments

B. Landscape Character

The abundance of water resources, including rivers, streams, brooks, ponds and wetlands, provide wildlife corridors and recreational opportunities. Many of Hanover's roads are country roads lined with trees. Hanover is also rich with historical and cultural resources. Efforts should be made to retain these characteristics. Commercially zoned areas in town are for the most part restricted to major routes such as Route 53 and 139. Developing new forest trails and greenbelts, and enhancing those that already exist is goal set forth in this plan. To achieve this goal of maintaining trails, protecting open farmland and enhancing water views will require planning and financial commitment.

C. Water Resources

1. Surface Waters

Hanover, which lies within the North River Watershed, is rich in water resources and has a varied natural landscape that includes streams, ponds, wetlands and wildlife habitats. Almost 20% percent of Hanover's terrain is comprised of water bodies and water-related land forms, including wetlands *(see Figure 3-3).* In addition to the rivers that form Hanover's borders, the Drinkwater River meanders through the western side of town. Numerous streams also meander across the town, including: Ben Mann Brook Shinglemill Brook, Silver Brook, Molly's Brook, Torrey Brook, Iron Mine Brook, Cushing Brook and Longwater Brook. Hanover also has boasts numerous ponds and swamps, including: Forge Pond, Hackett Pond, Shinglemill Pond, Peterson Pond, Mill Pond, Factory Pond, Pine Island Swamp, Wampum Swamp, Peg Swamp, Hell Swamp and a small portion of Beech Hill Swamp in south western section of town (majority is in Rockland).

Table 4-4
Surface Waters in Hanover

Drinkwater River	Luddam's Ford Pond	Cushing Brook
Indian Head River	Lily Pond	Longwater Brook
North River	Hell Swamp	Torrey Brook
Forge Pond	Old Pond Swamp	Iron Mine Brook
Shinglemill Pond	Pine Island Swamp	Silver Brook
Hackett Pond	Peg Swamp	Molley Brook
Factory Pond	Wampum Swamp	Shingle Mill Brook
Mill Pond	French Stream	Third Herring Brook
Peterson Pond	Ben Mann Brook	

Source: USGS Topographic Maps; Whitman, Hanover, Weymouth, Cohasset Quadrangles

Details on Hanover's surface waterbodies located in Hanover are described in Table 4-5. A phone interview, conducted on March 25, 1996, with Warren Kimball, an Environmental Engineer with the DEP Office of Watershed Management, provided the information on the size and water quality classification of the waterbodies. Availability of public access to each waterbody was determined through field inspections.

Table 4-5
Classification of Surface Waters in Hanover

Waterbody	*Classification*	*Status*[2]	*Pollutant - Sources*[2]	*Access*
French Stream	B[1]	PS	Organic enrichment/DO, nutrients, pathogens - natural municipal point sources, non-urban runoff	
North River	SA[1]	NS	Organic enrichment/DO, nutrients, pathogens - septic tanks, non-urban runoff, marinas	
Drinkwater River	B[1]			Summer Street near Rockland line. Also Route 139 in West Hanover (canoe)
Indian Head River	B[1]	PS	Nutrients, organic enrichment/ DO - municipal point sources, natural	Indian Head Drive (canoe launch)
Forge Pond[3]	B			
Shinglemill Pond	B			Webster & North Streets
Hackett Pond	B			SSNSC land on Hacketts Pond Drive
Factory/Lily Pond[3]	B			King Street
Mill Pond	B			
Peterson Pond	B			
Third Herring Brook	B[4]			
Ben Mann Brook	B			None
Cushing Brook	B			Whiting and Circuit Streets
Longwater Brook	B			Summer & Hanover Streets
Torrey Brook	B			
Iron Mine Brook	B			
Silver Brook	B			
Molley Brook	B			
Luddam's Ford Pond				Elm & Water Streets (canoe)
Shingle Mill Brook	B			Webster & North Streets

[1] 314 CMR 4.06 Table 29, South Shore Coastal Drainage Area
[2] Massachusetts Bays 1995 Comprehensive Conservation and Management Plan "An Evolving Plan for Action" (*see "Status Codes" below for key)*
[3] No fishing due to mercury contamination
[4] According to a conversation with Warren Kimball, DEP, there is a restriction on increasing discharges

The DEP has not had the opportunity to sample every waterbody within the state, therefore, only the asterisked waterbodies in the above table have been classified. According to DEP policy, waterbodies that have not been classified are assumed to be Class B (if freshwater) or SA (if saltwater). The water quality classification of the unlisted waters are not based on sampling results. The water quality classifications are as follows:

Freshwater:

Class A - waters considered suitable for use as public drinking water supply;
Class B - waters suitable for aquatic life and wildlife and for primary and secondary contact recreation; and
Class C - waters suitable for aquatic life and wildlife and secondary recreation only

Saltwater:

Class SA - waters suitable for aquatic life and wildlife, primary and secondary contact recreation, and, in approved areas, shellfish harvesting;
Class SB - waters suitable for aquatic life and wildlife, primary and secondary contact recreation, and, in approved areas, shellfish harvesting; and
Class SC - waters suitable for aquatic life and wildlife, secondary contact recreation, and certain industrial cooling and process uses.

Status Codes:

S = supports all indicated uses
S/T = supports all uses, but threatened
PS = supports some uses
NS = supports no uses

2. Flood Hazard Areas

Hanover has six Floodway Boundary and Floodway maps (Floodway) and six Flood Insurance Rate Maps (FIRM) which show the areas subject to flooding within the town *(see Figure 3-4)*. The Floodway maps include the boundaries of all floodways in the town, while the FIRM maps designates zones of flooding including information on the probable depth of maximum high water in the floodways.

Because of Hanover's extensive river and tributary system, many flood hazard areas are spread throughout the town. All of the streams and brooks which are part of the Drinkwater River system have areas of potential flood hazard. On the west side of Hanover the Shingle Mill Brook, Cushing Brook, Ben Mann Brook, and the Torrey Brook present limited flood hazard as well as larger open wetland or swamp areas. Flooding from the Longwater Brook and French Stream is more confined to areas directly adjacent to the banks of the waterways. The Drinkwater river is also fed by Pine Island Swamp, Peg Swamp, Hell Swamp and Wampum Swamp, as well as an unnamed wetlands north of Route 139 between Plain Street and Grove Street and an area behind Cedar School all of which are marked as areas of 100-year flood hazard. The last areas of flood hazard area associated with the Drinkwater River system is a section of Beach Hill swamp on the western boundary of Town.

Flood hazard associated with Third Herring Brook and the Indian Head River Drainage areas are more limited than the Drinkwater river system. Molly Brook and Silver brook drain into the Third Herring Brook with few areas of expansive flood hazard. The most notable exception is Old Pond Meadows along Third Herring Brook; however, the majority of this wetland is in the bordering town of Norwell. Iron Mine Brook, part of the Indian Head River Drainage area, has several wetland and swamp areas which present 100-year flood hazard. These wetland areas are located to the west of Route 53 between Hanover Street and Silver Street and surrounding the cranberry bogs downstream. Other flood areas along the Indian head river are limited, aside from a few small unnamed streams which could potentially flood areas where water drains into

the Indian Head River. The last area marked on the FIRM and Floodway maps, below the Curtis Crossing Dam forming the headwaters of the North River, shows a wetland area subject to flooding in the southeast corner of the Hanover.

It should also be noted that there are a few wetland areas in Hanover which do not appear on the FIRM and Floodway maps. The USGS topographic quadrangles which include Hanover show a wetland area between Colonial Drive and Main Street in the center of Hanover, a small wetland area northeast of the intersection of Whiting, Cedar and Pleasant streets, and an area equidistant between Forge Pond and the town line between Rockland and Hanover. Four other small wetland areas which are not included on the Firm or Floodway maps are an area west of Bardin Street, an area northeast of the intersection of Center Street and Old Cross Street, an area south of Route 139 and west of Tindale Way, and as area north of the intersection of Grove Street and Main Street. All of the above mentioned wetland areas are noted on the local Wetlands Map even though they don't appear on the FIRM or Floodway map.

3. Wetlands

The streams, brooks and rivers in Hanover support an extensive wetlands system which generally follows the dominant drainage patterns and waterways in the town. Wetlands make up 20% of the land within Hanover, and are important to the prevention of flooding and the protection of water quality *(see Figure 3-3)*. However, these resource areas require proper management, in addition to wetlands regulation to successfully protect the functions that wetlands offer

The Drinkwater River system and contributing streams dominate wetlands on the western side of Hanover. The Benn Mann Brook, Shingle Mill Brook, Longwater Brook, Cushing Brook, French Stream and Drinkwater River all have major wetland areas associated with the channeled waterways. The generally flat topography with low, rolling hills, abundance of water, and favorable soils control the local hydrology, creating several large open swamps which are part of the extensive wetland and waterway system. Hell Swamp, Pine Island Swamp, Peg Swamp, and a section of Beech Hill Swamp are aligned across the center of the Town, and each of these swamps, eventually flow into the Drinkwater River System (even the Beech Hill Swamp which first drains into Rockland and back into Hanover along French Stream). Wetlands in the vicinity of Shingle Mill Brook and a northern section of Drinkwater River support habitats of rare wetland wildlife and certified vernal pools.

Wetlands in the southeast corner of Hanover, including some old cranberry bogs, are present along Iron Mine Brook, and an unnamed swamp, east of the town center is part of another large area of wetlands. The remainder of the Indian Head River Drainage Area, the southern portion of town, has smaller wetland areas scattered along tributaries or bordering the riverway.

The northeast part of town has few wetlands other than those associated with Hell Swamp; however, further south along the Third Herring Brook where the brook meets Molly/Silver Brook the waterway opens up to form the Old Pond Meadows. Although much larger section of the meadows is located in Norwell, a significant section of land is taken up by wetlands. Also,

wetlands associated with tributaries to the Third Herring Brook are scattered along the eastern edge of town which is defined by this major waterway.

4. Aquifer Recharge Areas

An aquifer protection zone is located within the eastern portion of the Town of Hanover. This zone is defined as the area in which the conditions indicate that the surface water and ground water within the area directly supply the Town wells. Three wellhead protection zones surrounding three well fields with a total of seven wells located within the aquifer protection zone.

Section VI.H. of the Hanover Zoning By-Law, dated May 1994, describes uses permitted and uses considered hazardous to the water supply and prohibited within the aquifer protection district. This section of the Zoning By-Law also describes the measures to be taken in order to insure water quality and sustained aquifer recharge within the Water Resource Protection Zone. These include limiting the area of impermeable surface and routing runoff from paved areas through water quality inlets prior to release to recharge the ground water.

D. Fisheries and Wildlife

According to the Massachusetts Natural Heritage & Endangered Species Program, Division of Fisheries & Wildlife, there are no endangered species of fisheries of wildlife within Hanover (note: they do identify several endangered/exemplary vegetation communities which are discussed in the vegetation section.)

The marshes, wet meadows, ponds and streams in Hanover, especially along the Town's three rivers, form a wildlife corridor and provide important wildlife habitat. Fisheries and wildlife species found in Hanover and southeastern Massachusetts are too numerous to list individually, however Table 4-6 lists some of the most common species found in the region.

Table 4-6: Common Wildlife and Fish Species in Southeastern Massachusetts

Rabbit	Trout	Turkey Vultures
Possum	Shad	Crows
Raccoon	Herring	Blue Jay
Fox, Red and Gray	Chain Pickerel	Cardinals
Coyotes	Large Mouth Bass	Chickadee
Deer	Small Mouth Bass	Red Wing Black Birds
Squirrel, Red, Gray, Flying	Yellow Perch	Grackels
Bats	White Perch	Starlings
Chipmunk	Sunfish, Pumpkin Seed, Blue Gill	English Sparrows
Moles	Suckers	Morning Doves
Mice	Minnows and other small fish	Bob White Quail

River Otter	Gray Horned Owl	Ruffed Grouse
Beaver	Bard Owl	Ring Neck Pheasant
Mink	Screech Owl	Canadian Geese
Weasel	Saw Wet Owl	Mallard
Skunk	Hawk	
Muskrat	Osprey	

Source: Telephone conversation with Dick Turner of Massachusetts Division of Fisheries and Wildlife, Southeastern Massachusetts Field Office. October 9, 1996.

Areas of the North River, downstream from Hanover, provide an important habitat for spawning and migration of Alewife, American shad White perch, Rainbow smelt, and Atlantic tomcod fish species. Atlantic salmon are listed as using this same area as a migratory area. In addition, the outer estuary area of the North River is listed as shellfish growing waters for mussels and oysters. Upstream areas such as Hanover must be very cognizant of water quality in the North River, and effects of point and non-point source runoff on the ability of the North River to support economically valuable fisheries.[10]

E. Scenic Resources and Unique Environments

1. Unique Features/Resources

Attendees at the Open Space public forum on August 14, 1996, also indicated that the following aspects of Hanover make the community unique:

- North River
- Indian River
- Historic Buildings - Quaintness
- History/Historic Resources
- Abundance of Wetland Resources
- Country atmosphere

Additionally, the following features/resources are also unique to Hanover:

Vernal Pools: A parcel of town-owned woodlands on Silver Street contains two vernal pools, one of which is certified by the Massachusetts Natural Heritage and Endangered Species Program (administered by the state's Division of Fisheries and Wildlife). The certified pool is reported to be home to spring peepers, fairy shrimp, toad tadpoles and caddis fly cases.

Rainbow Bridge: A footbridge across Third Herring Brook was used as a shortcut from the Hanover yards to Fox Hill. Names for its bowed shape, it has long since disappeared.

[10] Atlantic Coast Ecological Inventory, Boston Quadrangle. (42070-A1-250) US Fish & Wildlife Service. 1980.

Hanover Yards (1668-1844): Looking downstream from the stone bridge, eleven shipyards could be seen with vessels in various stages of construction during the peak years of shipbuilding activity. From 1800 to 1808 at least 10 ships per year were built here by a work force of 400 ship carpenters. Two plaques mark the sites.

Washington Street Bridge: Wm. Barstow received 12 pounds sterling from the Colony in 1656 for building the first bridge to cross the North River. For foot and horse traffic only, it stood slightly upstream of the existing bridge. Replaced in 1682 with a cart bridge, the old stone abutments remain visible. The current location was first built on in 1829, and the present stone bridge was completed in 1904.

The Crotch: At the head of the North River, formed by the confluence of the Indian Head River and Heritage Brook, this is one of only three major freshwater tidal marshes in Massachusetts.

Indian Head Canoe Launch: A combination of state and local agencies owns 50+ acres of conservation land in Hanover alongside the Indian Head River.

Luddam's Ford: The North River's easternmost foot crossing on the Old Bay Path going from Plymouth to Boston was named for the guide who carried Governor Winthrop across the river in 1632 on the way to visit Governor Bradford of Plymouth.

Chapman's Landing: This was the westernmost shipping point on the river. Iron ingots were landed at Humarock for shipment to the Hanover forges. The North River-built steamship "Mattakeesett" was used in this service.

Luddam's Ford Fish Ladder: Site of the early mills and Curtis Anchor Works, famous for the casting of the "Constitution" anchor. Later, the site of the Clapp Rubber Mills (1873), largest of its kind in the country. The remaining dam forces migrating fish to scale the fish ladder in their efforts to reach spawning locations upstream. Conservation land on both sides of the Indian Head River provides canoe access to the Wampanoag Indian Passage.[11]

2. Scenic Resources/Landscapes

The North River which runs through the southeastern portion of Hanover has been classified as a scenic river by the Commonwealth of Massachusetts Scenic River Protection Act of 1980 and by the U.S. Park Service National Natural Landmark enacted circa 1980. The scenic river corridor extends to the Cross Street Bridge. The Hanover Conservation Commission received a plaque recognizing the Town's success at preserving the significant area of the North River. The North River Commission was established to administer the provision of the Federal Scenic and Recreational River Protection Order for the North River. The NRC is comprised of representatives of all the towns through which the North River flows, including Hanover. A portion of the Third Herring Brook is also included in the Scenic Rivers Act.

[11] The North and South Rivers Guide: North and South Rivers Watershed, Assoc. Inc. 1993

Attendees at the Open Space public forum on August 14, 1996, also listed the following as Hanover's most scenic views/landscapes *(see Figure 4-2 and Section 3.{A.3.})*:

- North River
- Indian Head River
- Luddam's Ford
- Town Hall area
- Folly Hill
- Ponds off Ring Street
- Robinson Pasture
- Third Herring Brook
- Sylvester Fields
- Absolom Rock
- Hacketts Pond
- Broadway

3. Cultural and Historic Areas

According to Massachusetts Historical Commission's (MHC) Massachusetts Cultural Resources Information System (MACRIS), there are 340 historic buildings and sites in Hanover. Many of these historic resources predate incorporation of Town in 1727. Historic buildings include Table 4-7 lists most of the locally significant historical buildings and sites in Hanover.

Table 4-7: Historic Buildings/Sites in Hanover

Historic Name	Street Number	Location
Percy Bonney Blacksmith Shop	20 Broadway	Hanover
Laphain House	53 Broadway	Hanover
Clark House	60 Broadway	Hanover
Charles Gleason House	96 Broadway	Hanover
Daniel Turner House	168 Broadway	Hanover
Robert Dwelley House	178 Broadway	Hanover
Hanover Fire Company No. 5	207 Broadway	Hanover
Broadoak Farm	336 Broadway	Hanover
Benjamin Stetson House	519 Broadway	Hanover
Joseph Josselyn House	607 Broadway	Hanover
Thomas Merritt House	677 Broadway	Hanover
Isacc Buck House	741 Broadway	Hanover
Saint Mary's Catholic Church	758 Broadway	South Hanover
Elijah Sylvester House	839 Broadway	South Hanover
J. Sylvester House	887 Broadway	South Hanover
Thomas Josselyn House	1003 Broadway	South Hanover
South Hanover General Store	1143 Broadway	South Hanover
Broadway Bridge Over Indian Head River	Broadway	South Hanover
Hoxia House	119 Center Street	Hanover Center
Timothy Robbins House	271 Center Street	Hanover Center
Shuble Munroe House	339 Center Street	Hanover Center
Seth Bates House	553 Center Street	Hanover Center
Saint Andrews Church	17 Church Street	Hanover
Dr. Howes House	31 Church Street	Hanover
Historic Name	**Street Number**	**Location**

Hatch Farm	561 Circuit Street	Fireworks
Prince Stetson House	615 Circuit Street	Fireworks
King Street Grammar	625 Circuit Street	West Hanover
Mordecai Ellis House	676 Circuit Street	West Hanover
Ellis Pratt House	939 Circuit Street	West Hanover
Darling Cemetery	959 Circuit Street	West Hanover`
David Darling House	969 Circuit Street	West Hanover
Clapp Rubber Factory Worker Housing	8 Clapp Road	South Hanover
Columbia Road Bridge over North River	Columbia Road	Hanover
South Hanover Train Station	172 Cross Street	South Hanover
Philips Tack Factory Stetson House	Cross Street	South Hanover
Abner Dwelley House	48 Elm Street	Hanover
Bailey - Donnell House	250 Elm Street	Curtis Crossing
Absaloms Rock	Great Rock Road	North Hanover
Theophilus Witherell House	49 Grove Street	Hanover Center
Nathaniel Stetson House	118 Hanover Street	Hanover
Congregation Church Parsonage	515 Hanover Street	Hanover Center
John Curtis Free Library	534 Hanover Street	Hanover Center
First Congregational Church	547 Hanover Street	Hanover Center
Hanover Town Hall	550 Hanover Street	Hanover Center
Jashua Staples House	623 Hanover Street	Hanover Center
Edward Briscoe House	715 Hanover Street	Hanover Center
David Torrey House	769 Hanover Street	Hanover Center
Library Hall	1206 Hanover Street	West Hanover
Mill Philips	1390 Hanover Street	West Hanover
Josselyn Store-West Hanover Post Office	1452-145 Hanover Street	West Hanover
Mordecai Ellis House	1566 Hanover Street	West Hanover
Cyrus B. Josselyn House	113 King Street	Fireworks
Hanover Carding Mill	127 King Street	Fireworks
George R. Josselyn House	160 King Street	Fireworks
Charles Josselyn House	169 King Street	Fireworks
Hanover House	334 King Street	Fireworks
Stephen Bailey House	408 King Street	Fireworks
Amos Turner House	562 King Street	Fireworks
David Gardner House	590 King Street	Fireworks
Sylvester House	402 Main Street	
Win Stockbridge House	429 Main Street	
Alms Hanover House	506 Main Street	Mercer Square
Jacob Bailey House	526 Main Street	Mercer Square
Benjamin Curtis House	569 Main Street	Mercer Square
Arthur Bailey House	633 Main Street	North Hanover
Benjamin Stetson House	646 Main Street	North Hanover
Historic Name	**Street Number**	**Location**

John Curtis House	702 Main Street	North Hanover
Slop Shop	714 Main Street	Mercer Square
Ezra Whiting House	715 Main Street	North Hanover
Col. John Bailey House	733 Main Street	North Hanover
Curtis School	848 Main Street	North Hanover
Whiting Curtis House	894 Main Street	North Hanover
Jesse Curtis House	912 Main Street	North Hanover
Baptist Church Meeting House	992 Main Street	North Hanover
Hanover Baptist Church Parsonage	1024 Main Street	North Hanover
Thomas Hatch	1041 Main Street	North Hanover
C.G. Mann Store	1044 Main Street	North Hanover
Benjamin Mann House	1078 Main Street	North Hanover
Benjamin Mann House	1095 Main Street	North Hanover
Levi Mann House	1137 Main Street	North Hanover
John Brooks Store	1152 Main Street	North Hanover
Abner Curtis House	1264 Main Street	North Hanover
Jonathan Turner	1271 Main Street	North Hanover
Seth Curtis House	1305 Main Street	North Hanover
Civil War Monument	Main Street	North Hanover
John Studley House	134 Old Washington Street	North Hanover
Old Washington Street Bridge over North River	Old Washington Street	Hanover
Benjamin Studley House	146 Pleasant Street	Hanover
James Whiting	324 Pleasant Street	Hanover
Cyrus Josselyn House	112 School Street	Fireworks
Drinkwater Hall Firemans Association	School Street	Fireworks
Melzar Curtis House	294 Silver Street	Hanover Center
Hanover Cemetery	Silver Street	Hanover Center
Josselyn - Bates House	74 Spring Street	Hanover Center
Joseph Curtis House	66 Union Street	Mercer Square
Benjamin Curtis House	179 Union Street	Mercer Square
Turner and Whitman Law Offices	25 Washington Street	Hanover
Builder Sylvester House	40 Washington Street	Hanover
Edward G. Sylvester House	65 Washington Street	Hanover
Albert Smith House	128 Washington Street	Hanover
Hanover Academy Building	195 Washington Street	Hanover
Wales Tavern	199 Washington Street	Hanover
Joseph Eells House	232 Washington Street	Hanover
Jothan Cushing House	242-240 Washington Street	Hanover
Saint Andrews Church Rectory	288 Washington Street	Hanover
Barstow House	323 Washington Street	Hanover
Henchman Sylvester House	346 Washington Street	Hanover
Historic Name	**Street Number**	**Location**

Robert Sylvester House	417 Washington Street	Hanover
Brooks and Young General Store	2108-2111 Washington Street	Hanover
Watermans House	330 Water Street	South Hanover
Watermans Tack Factory	360 Water Street	South Hanover
Project Dale House	361 Water Street	South Hanover
Union Cemetary	Webster Street	North Hanover
Luddams Ford Bridge over Indian Head River	West Elm Street	Curtis Crossing
Sylvanus Whiting House	88 Whiting Street	Hanover
Justus Whiting House	111 Whiting Street	Hanover
Whiting Street School	142 Whiting Street	Hanover
Ezra Whiting House	183 Whiting Street	Hanover
William Whiting House	184 Whiting Street	Hanover
Joshua Mann House	335 Whiting Street	Hanover
David Cushing House	385 Whiting Street	Hanover
Wing House	64 Winter Street	Winslows Crossing

Source: Massachusetts Historical Commission MACRIS Street Index for Hanover. December, 1993.

4. Areas of Critical Environmental Concern

Although Hanover does not contain any State recognized Areas of Critical Concern (ACEC), as regulated by the Executive Office of Environmental Affairs (EOEA), the natural resources in Hanover are significant. 301 CMR 12.00 defines ACECs as "areas within the Commonwealth where unique clusters of natural and human resource values exist and which are worthy of a high level of concern and protection". Criteria for designation as an ACEC are:

- Threat to public health through inappropriate use
- Quality of the natural characteristics
- Productivity
- Uniqueness of area
- Irreversibility of impact
- Imminence of threat to resource
- Magnitude of impact
- Economic benefits
- Supporting factors.

These factors do not need to be weighed equally, nor must all the factors be present for an area to be designated. In Hanover, the water supply is a critical resource and any area that, if developed, may create a negative impact on the water supply is an area of critical environmental concern, regardless of the official designation from EOEA.

F. Environmental Problems

1. Hazardous Waste Sites

The Town of Hanover contracted an environmental database search by New England DataMap Technology Corporation. The resultant report, Environmental FirstSearch Report, dated April 4, 1996, contains a list of all sites located in Hanover which are listed in the databases searched. The Environmental FirstSearch Report is a screening tool which lists sites with potential or existing liabilities. Specific government databases searched include the National Priority List (NPL) and the Comprehensive Environmental Response Compensation and Liability Information System (CERCLIS) which list the EPA Superfund sites and potential Superfund sites respectively. This report also searched the state hazardous waste sites, spills listed with the state, solid waste landfills, underground storage tanks (USTs), and resource areas, public water supplies and aquifers.

Information contained in the database report included:

- Five sites are located on the CERCLIS database. These sites are: 1) the Hanover Town Dump which is listed as No Further Action Required (NFRA); 2) Hanover Printing (Not Proposed for NPL yet) ; 3) Mann Brook Swamp (Not Proposed); and 4) National Fireworks I and II (Not Proposed). According to this database report, no sites in Hanover are listed as Superfund sites.

- There are 18 sites in Hanover listed as State Hazardous Waste Sites
- 24 spill sites were recorded prior to 1990 and 58 spills have been recorded since 1990.
- 22 sites are listed as RCRIS hazardous waste generators. Of these 22, 14 are very small quantity generators, seven are small quantity generators and one is a large quantity generator.
- There are 23 registered USTs in Hanover.
- There are 8 listed locations of public water supplies.
- There are 3 reported active solid waste landfills. The landfills are identified as Simmons Lagoon, the Rockland Street landfill and the transfer station.

The information from the Environmental FirstSearch Report is general information regarding listed sites which have potential or existing liabilities. Site specific details regarding the listed sites can be obtained through the agencies responsible for these lists (i.e. DEP for State Hazardous Waste Sites and Spills).

2. Landfill

Hanover's seven (7) acre landfill, located on Rockland Street (Route 139) near its intersection with Route 53, was closed in 1972. It is unlined and approximately two acres have been capped. The Town is presently undergoing the approval process to cap approximately four (4) to four and one-half (4½) acres of the landfill. This process involves three steps:

1. Prepare an Initial Site Assessment utilizing information contained in town records.
2. Prepare a Comprehensive Site Assessment, which requires extensive data collection, testing and analysis.
3. The Department of Environmental Protection stipulates requirements for landfill cap based on previous two reports.

Hanover is presently performing Step #2 and expects to submit a Comprehensive Site Assessment to DEP in November/December of 1997. At this time, it is estimated that work will begin sometime in 1999, and will cost approximately $500,000.

Solid waste disposal and recycling is now handled at the Town Transfer Station located on the easterly side of Route 53. Browning Ferris Industries Waste Systems (BFI) has been contracted by the Town to transport waste from the transfer station to the Bridgewater Landfill. This contract is due to expire in June, 1997, and it is unknown whether BFI will continue to provide Hanover's waste removal services. Presently, solid waste disposal is a service provided to Hanover residents at no additional charge, beyond payment of property taxes. There is no curbside pickup of waste or recycling; the transfer station is drop-off only.

3. Erosion

The Department of Public Works is not aware of any areas with erosion problems.

4. Chronic Flooding

The Hanover Department of Public Works maintains a list of areas that experience flooding conditions during "extraordinary" rainfall events. These areas are:

a) A brook near Cedar and West Streets
b) Pleasant Street Brook located on Pleasant Street near Fire Station 3
c) Several brooks near Hanover Street (Route 139)
   Map 43/Lots 101 and 102 (near Tedeschi)
   Map 44 Lot 1
   Map 52 Lot 14

King Street (Map 51 Lot 19)

Additionally, the DPW identified the five worst drainage areas in Town as follows:

Location	**Reason**
1. The west end of Dillingham Way, near Main street	Inadequate drainage infrastructure
2. South end of Old Town Way near Henderson Lane	Low lying area
3. Block of Streets off southwest Pleasant Street (Jefferson Road, Brook Circle and Jackson Road)	Flat, low area
4. Indian Head development	Flat, low area

5. Northwest section of Town (Dwelley Avenue, Flat, low area Ponderosa Drive)

5. Sedimentation

The Department of Public Works is not aware of any areas with erosion problems.

6. Development Impact

The primary concerns for residents regarding development is both its effects on the quality of life in Hanover and its impacts on the environment. Residential housing development continues, as does commercial development along Route 53. There is a concern that this commercial development will begin to impinge on residential areas. This growth also strains existing drainage systems, increases road maintenance and repair costs and overburdens infrastructure. Managing town sewage will become a priority over the next few years due to an increase in residential development, plans to encourage commercial development to ease the residential tax burden and the new Title 5 regulations adopted by the state in early 1995.

7. Ground and Surface Water Pollution

In June, 1994, large mouth bass from Factory Pond tested with the highest level of mercury in the state, at three times the closure level. A "Do-Not-Eat" warning was established for the Forge Pond dam (above Factory Pond) down to the Luddam's Ford dam. Historically, the land surrounding Factory Pond was utilized for fireworks and munitions manufacturing, from 1907 to 1973. DEP has visited the site ands has issued Notices of Responsibility (NORs) to potentially responsible parties.